

DOCUMENT RESUME

ED 318 636

SE 051 390

AUTHOR Hart, Laurie E.; And Others
TITLE Teacher-Student Interaction and Achievement in a Seventh-Grade Mathematics Class.
PUB DATE 90
NOTE 37p.; Paper presented at the Annual Meeting of the American Educational Research Association (Boston, MA, April 16-20, 1990).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Classroom Communication; Grade 7; Junior High Schools; *Mathematics Achievement; Mathematics Instruction; Mathematics Teachers; *Racial Differences; *Secondary School Mathematics; *Sex Differences; Teacher Influence; *Teacher Student Relationship

ABSTRACT

The purposes of this study are to describe teacher-student interaction in a seventh-grade mathematics class and to examine the relationships between teacher-student interaction and achievement by race and sex. Sixteen students taught by a black male were studied. For 10 days near the middle of 45 classroom days, quantitative teacher-student interaction data were gathered. Achievement data was obtained from two standardized measures (Grade 6 Iowa Test of Basic Skills and American Junior High School Mathematics Examination) and four classroom achievement measures (Grade 6 final grade, Grade 7 November and January test grades, and Grade 7 second quarter grade). On all achievement measures, the means for the white students were higher than the means for the black students. On the teacher-student interaction measure, the black students had more total academic interactions and student-initiated academic interactions; the white students initiated more procedural interactions. The differences in means by sex were less than one-third of a standard deviation both on all three Grade 7 classroom measures and in each teacher-student interaction category. The white males and the black females had the most interactions, the most teacher-initiated interactions, and the most student-initiated interactions. (YP)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED318636

Teacher-Student Interaction and Achievement
in a Seventh-Grade Mathematics Class

Laurie E. Hart, George M. A. Stanic, and Nancy B. Mizelle
University of Georgia

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY
Nancy B. Mizelle

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as
received from the person or organization
originating it.

☐ Minor changes have been made to improve
reproduction quality.

• Points of view or opinions stated in this docu-
ment do not necessarily represent official
OERI position or policy.

Paper presented at the 1990 annual meeting of the American Educational Research
Association, Boston.

BEST COPY AVAILABLE

SE 051 390

Teacher-Student Interaction and Achievement in a Seventh-Grade Mathematics Class

The objectives of this study were to describe teacher-student interaction in a seventh-grade mathematics class and to examine the relationship between teacher-student interaction and achievement. We were particularly interested in studying the similarities and differences in the patterns of teacher-student interaction and achievement by race and sex.

Knowledge of mathematics is crucial for all members of our society. To participate fully in our democratic society and to be unrestricted in career choice and advancement, individuals must be able to understand and apply mathematical ideas. Certain groups, unfortunately, do not reach their potential in mathematics. Black students and female students are two of these groups. This study contributes to our understanding of how to view this problem and how teacher-student interaction may affect differential achievement.

White students outperform black students as early as primary school, and the differences are large (Anick, Carpenter, & Smith, 1981; Dossey, Mullis, Lindquist, & Chambers, 1988; Jones, Burton, & Davenport, 1984; Matthews, 1984; Matthews, Carpenter, Lindquist, & Silver, 1984; National Assessment of Educational Progress [NAEP], 1983; Reyes & Stanic, 1988). Boys and girls generally show similar performance in mathematics up to adolescence; sex differences in favor of males begin to appear sometime during adolescence. After an extensive review of studies of mathematics performance during the middle-school years (defined as Grades 4-8),

Lockheed, Thorpe, Brooks-Gunn, Casserly, and McAloon (1985) concluded that there are few, if any, consistent sex differences in mathematics performance on the types of mathematics skills taught at these grade levels. During the high-school years, boys begin to outperform girls in mathematics, especially on higher level cognitive tasks (Chipman, Brush, & Wilson, 1985; Dossey et al., 1988; Fennema, 1984; Fennema & Carpenter, 1981; Fennema & Peterson, 1984; NAEP, 1983; Steinkamp & Maehr, 1984). The differences are not large (Friedman, 1989), and have not been found by all researchers (e.g., Senk & Usiskin, 1983; Smith & Walker, 1988); furthermore, girls as a group tend to receive grades in their mathematics classes that are at least as good as (Chipman & Thomas, 1985) or better than (Stockard & Wood, 1984) the grades boys receive. So the achievement difference favoring males over females in mathematics is smaller, appears later, and is evident on a more limited range of measures than the difference favoring whites over blacks; but both differences are worthy of our attention. The mathematics achievement of race-sex groups has not been examined extensively, but there is some indication, for example, that black females outperform black males (Yando, Seitz, & Zigler, 1979).

Teacher-student interaction is one factor that affects student achievement (Brophy & Good, 1986; Good & Grouws, 1979). Furthermore, particular aspects of teacher-student interaction (e.g., number of interactions, initiator of interaction, interaction in public or private setting, cognitive level of academic interaction) have been shown to be significantly related to mathematics achievement (Fennema & Peterson, 1987). Across subject areas, there is some evidence that black students receive more negative feedback

from their teachers about their behavior (Aaron & Powell, 1982; Irvine, 1985) and their academic performance (Aaron & Powell, 1982) than white students do; there is, however, little research available about race differences in teacher-student interaction in mathematics classes. More is known about sex differences in teacher-student interaction. According to Brophy and Good (1974), compared to female students, male students receive more criticism, are praised more often for correct answers, have their work monitored more often, and have more contacts with their teachers. A number of studies of mathematics classes, in particular, confirm that males receive and initiate more interaction than do females (Becker, 1981; Brophy, 1985; Fennema & Peterson, 1987; Hart, 1989). There is some evidence, not specific to mathematics classes, of different interaction patterns among race-sex groups (Grant, 1985; Irvine, 1985, 1986). Irvine (1985) found that white females received significantly less total communication than black females, white males, and black males. Additionally, white females received less neutral behavioral feedback and less academic feedback than white males did.

In sum, we know much about mathematics achievement by race and by sex; we know little, however, of mathematics achievement by race-sex group. Differences in teacher-student interaction may account for differential achievement, but the extensive data on sex differences in interaction is limited by a lack of attention to race. As is true of the research on achievement differences, the results of interaction research do not speak to the particular experiences of different race-sex groups. We do not claim that the results of our case study can fill this gap in the research literature, but the study does begin to address neglected issues.

Method

An above average seventh-grade mathematics class (the second highest mathematics achievement group in the school) was studied during a 3-month period from October to January. The class of 17 students was taught by a black male. Parental permission to gather data was obtained for 16 students--4 black females, 3 black males, 5 white females, and 4 white males. For 10 days near the middle of the 45 classroom observation days, a trained observer used an instrument adapted from Brophy and Good (1970) and Hart (1989) to gather quantitative teacher-student interaction data. Categories included total number of interactions, behavioral interactions (i.e., discipline), academic interactions, procedural interactions (e.g., "Do page 29 for homework," "May I sharpen my pencil?"), and social interactions (e.g., "How is your aunt?"). The initiator of each interaction was also coded. Achievement data came from two standardized achievement measures (Grade 6 Iowa Test of Basic Skills [ITBS] overall mathematics percentile and the American Junior High School Mathematics Examination [AJHE]) and four classroom achievement measures (Grade 6 final grade, Grade 7 November test grade, Grade 7 January test grade, and Grade 7 second quarter grade).

Results

Mathematics Achievement

On all six achievement measures (see Figures 1-6), the means for the white students in the class were higher than the means for the black students, with the differences on the two standardized achievement measures greater than one-half of a standard deviation and the differences on the four classroom measures less than one-

third of a standard deviation. The direction of sex differences changed over time. On the first three measures (Grade 6 ITBS overall mathematics percentile, Grade 6 final grade, and Grade 7 November test), the female students had higher means than the male students. On the last three measures (Grade 7 AJHE score, Grade 7 January test, and Grade 7 second quarter grade), the male students had higher means than the female students. Again, the differences on the standardized achievement measures were greater than one-half of a standard deviation, and the differences on the classroom measures were less than one-third of a standard deviation.

Perhaps more important than the sex differences and the race differences in the classroom we studied was the pattern of achievement among the race-sex groups. Grade 6 final grades (maximum score 100) showed black females highest (88), followed by white males (87), white females (84), and black males (80). On the three Grade 7 classroom measures, white males and black females scored highest (with white males having a slightly higher score on two of the measures), followed by white females and black males. The standardized test scores were somewhat different. On both the ITBS and AJHE, white males scored highest, followed by white females, black females, and black males. On the ITBS, the black males stood out with a particularly low percentile compared to the other three groups (a percentile of 57 compared to percentiles in the 70s). On the AJHE, the white males stood out with a score higher than that of the other three groups (a percent score of 33 compared to percent scores in the low 20s).

Teacher-Student Interaction

In this classroom, there was a mean of over four and one-half interactions per student per day with slightly more initiated by the student (2.29) than by the teacher (1.93). Most of the interactions in the class were academic (2.04 per student per day), followed by procedural (1.74), behavioral (.43), and social (.36).

Total interactions. The teacher-student interaction instrument revealed sex and race differences of less than one-fourth of a standard deviation for total interactions per day (see Figures 7-9). However, there were important differences in total interactions among the four race-sex groups. The means for the black females and white males were more than one-third of a standard deviation above the means for the white females and black males. A similar pattern appeared when total interactions were categorized by initiator. Both black females (by more than one-half of a standard deviation) and white males (by more than one-third of a standard deviation) had more teacher-initiated interactions than the white females and the black males. The means for student-initiated interactions of the black females and white males were more than one-third of a standard deviation above the mean for the white females and more than one-half of a standard deviation above the mean for the black males.

Academic interactions. The largest differences among groups were found in academic interactions (see Figures 10-12). The mean of academic interactions for black students was more than one-third of a standard deviation above the mean for white students; the males and females differed by less than one-fourth of a standard deviation. Among the race-sex groups, the black females stood out in a positive direction in total

academic interactions (more than one-half of a standard deviation above the other three groups), teacher-initiated academic interactions (more than one-third of a standard deviation above the next highest group, the white males), and student-initiated academic interactions (more than one-half of a standard deviation above the next highest group, again the white males).

Procedural interactions. In procedural interactions (see Figures 13-15), the white males stood out with a mean for procedural interactions that was more than one-third of a standard deviation above the next highest group. This difference is due largely to the number of procedural interactions initiated by the white males.

Social interactions. There were no large differences by race, sex, or race-sex group for total social interactions or student-initiated social interactions (see Figures 16-18). There were, however, differences in teacher-initiated social interactions. White males and black females stood out as recipients of more teacher-initiated social interactions, with the means for both groups more than one-third of a standard deviation above the mean for the white females and more than one-half of a standard deviation above the mean for the black males.

Behavioral interactions. The groups did not differ widely in behavioral interactions (see Figure 19). All differences were less than one-third of a standard deviation.

Summary

Race. On all six achievement measures, the means for the white students were higher than the means for the black students. On each classroom measure, the

difference was less than one-third of a standard deviation; on each standardized measure, the difference was greater than one-half of a standard deviation. On the teacher-student interaction measure, the black students had more total academic interactions and student-initiated academic interactions; the white students initiated more procedural interactions.

Sex. On the first three achievement measures, the females had higher means than the males; the order was reversed on the last three measures. The difference in means was less than one-third of a standard deviation on all three Grade 7 classroom measures. In each teacher-student interaction category, the difference in means by sex was less than one-third of a standard deviation.

Race-sex. The white male students were at or near the top of the four race-sex groups on both standardized and classroom achievement measures, and the black males were at the bottom. On the four classroom measures, the white males and the black females had the highest means; on the two standardized measures, the white males and the white females had the highest means. When there were differences in teacher-student interactions among the four race-sex groups, they were in favor of the white males or the black females. The white males and the black females had the most interactions, the most teacher-initiated interactions, and the most student-initiated interactions. In the subcategories, the black females had the most academic interactions, regardless of initiator; the white males had the most procedural interactions, due largely to those they initiated themselves; and both groups had the most teacher-initiated social interactions. No group stood out in behavioral interactions.

Discussion

The achievement differences by race and by sex in this seventh-grade classroom reflect, to a certain extent, national patterns. As is true nationally, the white students demonstrated higher achievement than the black students. The sex differences in achievement in favor of males that appeared by the end of our case study (i.e., on the last three achievement measures) reflect what happens nationally during high school. However, it is important to recognize that on all three Grade 7 classroom achievement measures the differences in our class both by race and by sex were less than one-third of a standard deviation.

What may be most important about our achievement results is what we have little to compare with nationally: The sex differences in achievement within the two race groups were in opposite directions, with the white males and the black females demonstrating higher achievement. The relatively high performance of our black females confirms the finding of Yando et al. (1979).

Among the interaction results, two of ours stand out as different from other research and one confirms a previous finding. We did not find blacks receiving more negative behavioral feedback than whites, nor did we find males having more interactions with their teacher than females. However, in support of Irvine's (1985) finding that white females were low in teacher-student interaction compared to the other race-sex groups, our white females were low, along with the black males, in total, academic, and teacher-initiated social interactions. Just as they did in achievement, the white males and the black females stood out in a positive direction in interactions--both

groups in total interactions and teacher-initiated social interactions, the white males in procedural interactions, and the black females in academic interactions.

There is, then, an interesting connection between the achievement data and the interaction data, with slightly different relationships depending on the achievement measures and interaction categories used. The means on the classroom achievement measures seem to be related to the number of total interactions and academic interactions, and the means on the standardized achievement measures seem to be related to the number of total procedural and student-initiated procedural interactions. Black females and white males scored highest on the classroom achievement measures and had the most total and academic interactions. The order of means among the four race-sex groups for total procedural and student-initiated procedural interactions (white males, white females, black females, black males) was the same as the order of the means on the standardized achievement measures. The classroom achievement measure differences among the four groups were smaller than the standardized achievement measure differences; the academic interaction differences among the four groups were larger than the procedural interaction differences. So relatively large academic interaction differences were reflected in relatively small classroom achievement differences, and relatively small procedural interaction differences were reflected in relatively large standardized achievement differences.

Therefore, the most important achievement and interaction results were found when we focused on the four race-sex groups. It is this focus that is neglected in the research literature. When we looked at these four groups, we found a connection

between interaction patterns and achievement. Furthermore, we found that it was particularly misleading to talk about general sex differences. In fact, in the classroom we studied, the groups closest to each other in achievement and interaction were the black females and white males, on the one hand, and the white females and black males, on the other hand. Our study points to the need to see how the experiences of the students in this class might be linked to the experiences of other students in other mathematics classrooms.

References

- Aaron, R., & Powell, G. (1982). Feedback practices as a function of teacher and pupil race during reading groups instruction. Journal of Negro Education, 51, 50-59.
- Anick, C. M., Carpenter, T. P., & Smith, C. (1981). Minorities and mathematics: Results from the National Assessment of Educational Progress. Mathematics Teacher, 74, 560-566.
- Becker, J. R. (1981). Differential treatment of females and males in mathematics classes. Journal for Research in Mathematics Education, 12, 40-53.
- Brophy, J. (1985). Interactions of male and female students with male and female teachers. In L. C. Wilkinson and C. B. Marrett (Eds.), Gender influences in classroom interaction (pp. 115-142). Orlando, FL: Academic.
- Brophy, J. E., & Good, T. L. (1970). Brophy-Good system (teacher-child dyadic interaction). In A. Simon & E. Boyer (Eds.), Mirrors for behavior: An anthology of observation instruments continued. 1970 supplement. Volume A. Philadelphia: Research for Better Schools.
- Brophy, J. E., & Good, T. L. (1974). Teacher-student relationships: Causes and consequences. New York: Holt, Rinehart, & Winston.
- Brophy, J. E., & Good, T. L. (1986). Teacher behavior and student achievement. In M. C. Wittrock (Ed.), Handbook of research on teaching (3rd ed.) (pp. 328-375). New York: Macmillan.
- Chipman, S. F., Brush, L. R., & Wilson, D. M. (Eds.). (1985). Women and mathematics: Balancing the equation. Hillsdale, NJ: Erlbaum.

- Chipman, S. F., & Thomas, V. G. (1985). Women's participation in mathematics: Outlining the problem. In S. F. Chipman, L. R. Brush, & D. M. Wilson (Eds.), Women and mathematics: Balancing the equation (pp. 1-24). Hillsdale, NJ: Erlbaum.
- Dossey, J. A., Mullis, I. V. S., Lindquist, M. M., & Chambers, D. L. (1988). The mathematics report card: Are we measuring up? Trends in achievement based on the 1986 national assessment. Princeton, NJ: Educational Testing Service.
- Fennema, E. (1984). Girls, women, and mathematics. In E. Fennema & M. J. Ayer (Eds.), Women and education: Equity or quality? (pp. 137-164). Berkeley, CA: McCutchan.
- Fennema, E., & Carpenter, T. P. (1981). Sex-related differences in mathematics: Results from National Assessment. Mathematics Teacher, 74, 554-559.
- Fennema, E., & Peterson, P. L. (1984). Classroom processes, sex differences, and autonomous learning behaviors in mathematics (National Science Foundation Contract No. SED 8109077). Madison, WI: University of Wisconsin-Madison.
- Fennema, E., & Peterson, P. L. (1987). Effective teaching for girls and boys: The same or different? In D. C. Berliner & B. V. Rosenshine (Eds.), Talks to teachers (pp. 111-125). New York: Random House.
- Friedman, L. (1989). Mathematics and the gender gap: A meta-analysis of recent studies on sex differences in mathematical tasks. Review of Educational Research, 59(2), 185-213.

- Good, T. L., & Grouws, D. (1979). The Missouri Mathematics Effectiveness Project: An experimental study in fourth-grade classrooms. Journal of Educational Psychology, 71, 355-362..
- Grant, L. (1985). Race-gemder status, classroom interaction, and children's socialization in elementary school. In L. C. Wilkinson and C. B. Marrett (Eds.), Gender influences in classroom interaction (pp. 57-77). Orlando, FL: Academic.
- Hart, L. E. (1989). Classroom processes by sex and confidence level. Journal for Research in Mathematics Education, 20(3), 242-260.
- Irvine, J. J. (1985). Teacher communication patterns as related to the race and sex of the student. Journal off Educational Research, 78(6), 338-345.
- Irvine, J. J. (1986). Teacher-student interactions: Effects of student race, sex, and grade level. Journal of Educational Psychology, 78(1), 14-21.
- Jones, L. V., Burton, N. W., & Davenport, E. C., Jr. (1984). Monitoring the mathematics achievement of black students. Journal for Research in Mathematics Education, 15, 154-164..
- Lockheed, M. E., Thorpe, IM., Brooks-Gunn, J., Casserly, P., & McAloon, A. (1985). Sex and ethnic differences in middle school mathematics. science and computer science: What do we know? Princeton, NJ: Educational Testing Service.
- Matthews, W. (1984. Influences on the learning and participation of minorities in mathematics. Journal for Research in Mathematics Education, 15, 84-95.

- Matthews, W., Carpenter, T. P., Lindquist, M. M., & Silver, E. A. (1984). The Third National Assessment: Minorities and mathematics. Journal for Research in Mathematics Education, 15, 165-171.
- National Assessment of Educational Progress. (1983). The third national mathematics assessment: Results, trends and issues (Report No. 13-MA-01). Denver: Education Commission of the States.
- Reyes, L. H., & Stanic, G. M. A. (1988). Race, sex, socioeconomic status, and mathematics. Journal for Research in Mathematics Education, 19, 26-43.
- Senk, S., & Usiskin, Z. (1983). Geometry proof writing: A new view of sex differences in mathematics ability. American Journal of Education, 91, 187-201.
- Smith, S. E., & Walker, W. J. (1988). Sex differences on New York State Regents examinations: Support for the differential course-taking hypothesis. Journal for Research in Mathematics Education, 19, 81-85.
- Steinkamp, M. W., & Maehr, M. L. (Eds.). (1984). Advances in motivation and achievement: Vol. 2. Women in science. Greenwich, CT: JAI.
- Stockard, J., & Wood, J. W. (1984). The myth of female underachievement: A reexamination of sex differences in academic underachievement. American Educational Research Journal, 21, 825-838.
- Yando, R., Seitz, V., & Zigler, E. (1979). Intellectual and personality characteristics of children: Social-class and ethnic-group differences. Hillsdale, NJ: Erlbaum.

Figure Captions

- Figure 1. *Grade 6 Iowa Test of Basic Skills overall mathematics percentile.*
- Figure 2. Grade 6 final grade.
- Figure 3. Grade 7 November test score.
- Figure 4. Grade 7 American Junior High School Mathematics Examination score.
- Figure 5. Grade 7 January test score.
- Figure 6. Grade 7 second quarter grade.
- Figure 7. Total interactions per day.
- Figure 8. Teacher-initiated interactions per day.
- Figure 9. Student-initiated interactions per day.
- Figure 10. Academic interactions per day.
- Figure 11. Teacher-initiated academic interactions per day.
- Figure 12. Student-initiated academic interactions per day.
- Figure 13. Procedural interactions per day.
- Figure 14. Teacher-initiated procedural interactions per day.
- Figure 15. Student-initiated procedural interactions per day.
- Figure 16. Social interactions per day.
- Figure 17. Teacher-initiated social interactions per day.
- Figure 18. Student-initiated social interactions per day.
- Figure 19. Behavioral interactions per day.

ITBS 6

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	71.29	76.14	66.43	67.86	74.71	76.25	56.67	76.00	73.75
SD	13.47	7.88	16.61	17.05	8.65	8.26	21.01	9.17	9.54

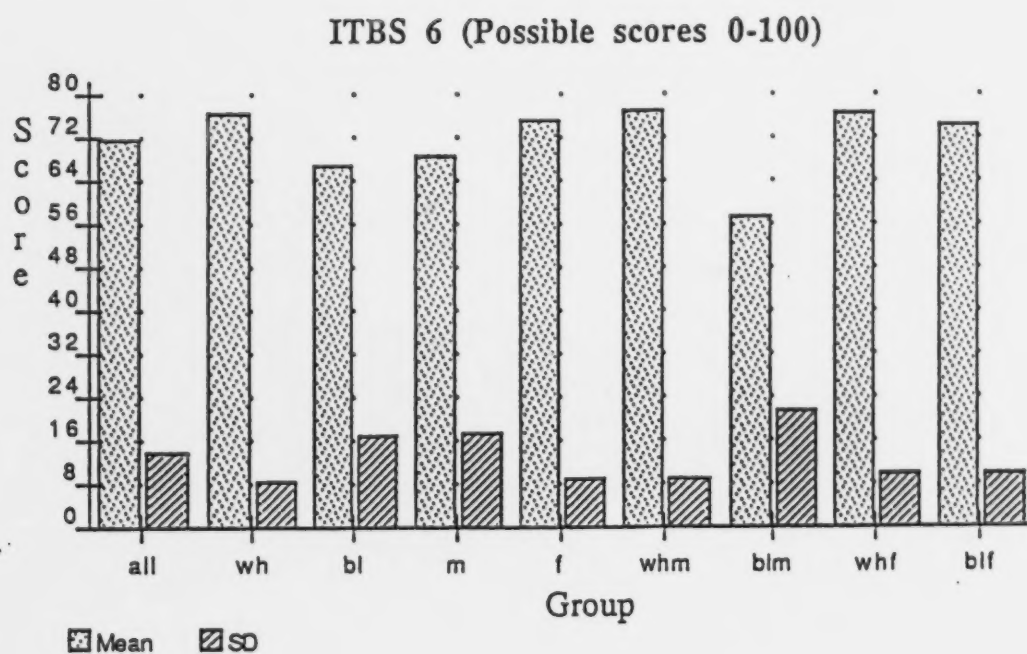


Figure 1

Grade 6

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	85.00	85.33	84.57	83.86	85.89	86.50	80.33	84.40	87.75
SD	5.77	6.26	5.53	6.59	5.28	6.61	5.69	6.58	2.87

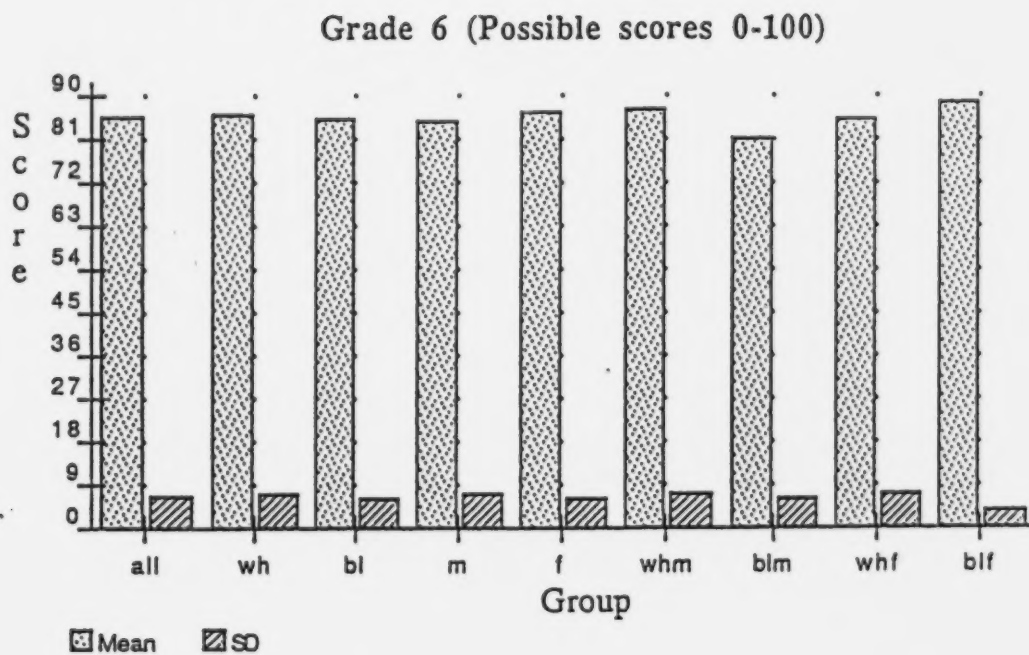


Figure 2

November Test

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	81.37	83.78	78.29	78.29	83.78	87.00	66.67	81.20	87.00
SD	18.53	19.94	17.56	20.37	17.82	16.51	21.94	23.91	7.70

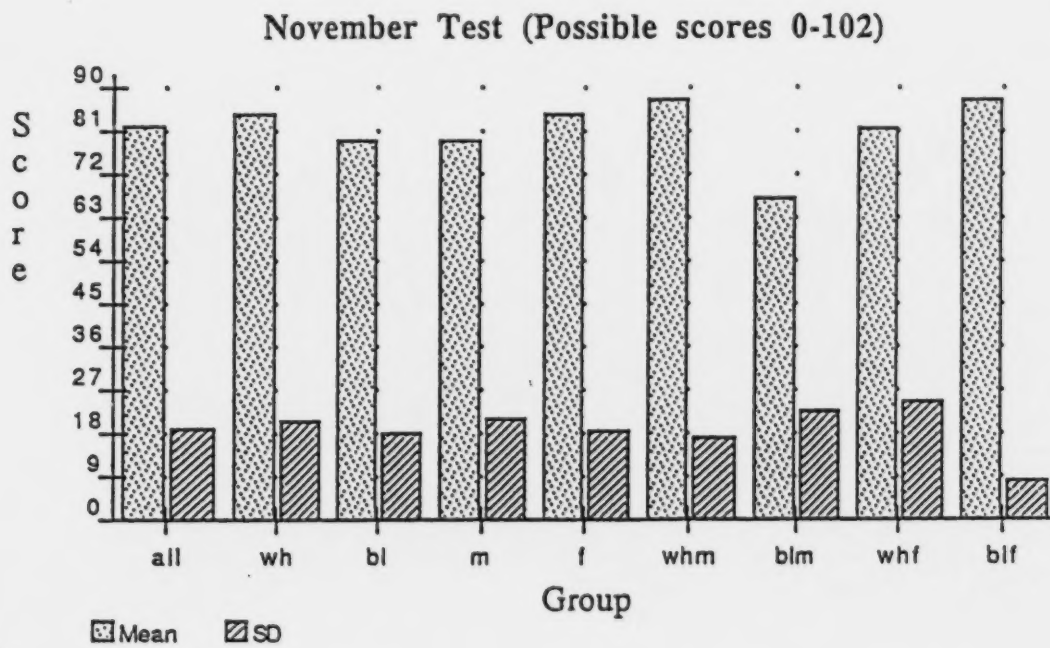


Figure 3

Junior High Test

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	25.25	28.00	21.71	27.43	23.56	33.00	20.00	24.00	23.00
SD	7.26	6.63	6.87	9.91	4.22	5.03	10.58	4.90	3.83

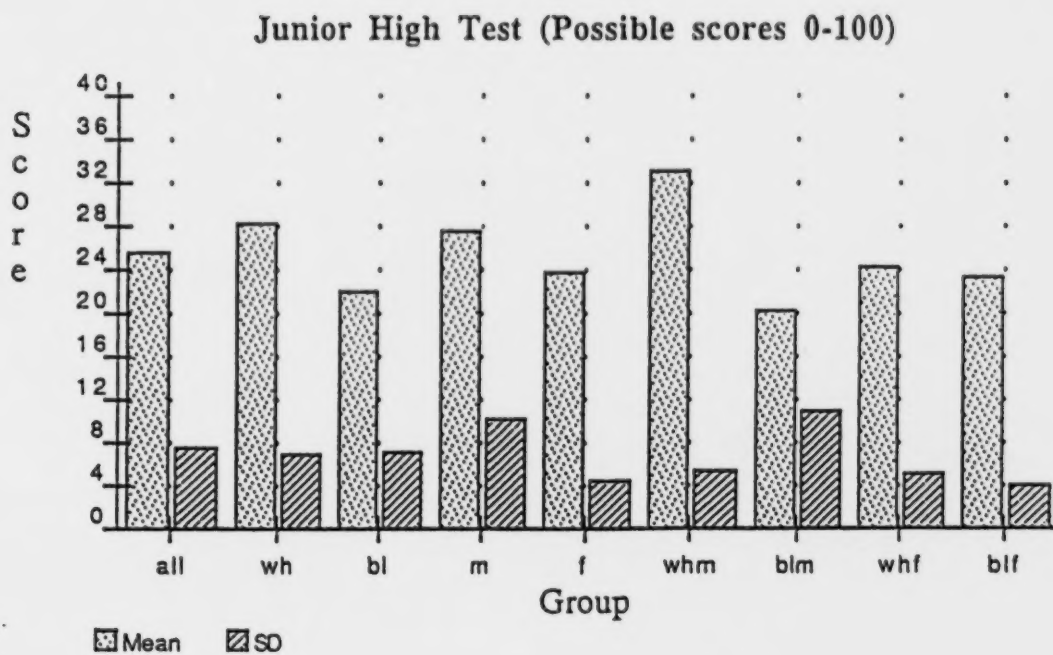


Figure 4

January Test

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	80.06	80.67	79.29	81.00	79.33	83.50	77.67	78.40	80.50
SD	7.89	9.92	4.82	8.06	8.17	9.68	5.03	10.60	5.00

January Test 7 (Possible scores 0-100)

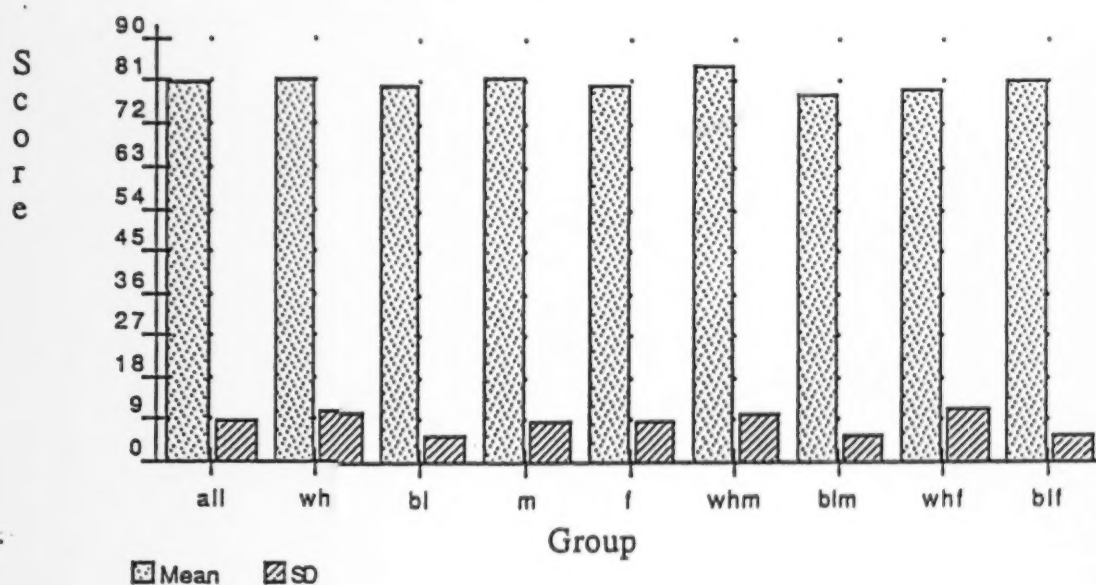


Figure 5

Quarter Grade 7

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	84.00	84.33	83.57	84.57	83.56	88.00	80.00	81.40	86.25
SD	7.16	9.33	3.46	5.97	8.31	5.89	0.00	11.13	1.26

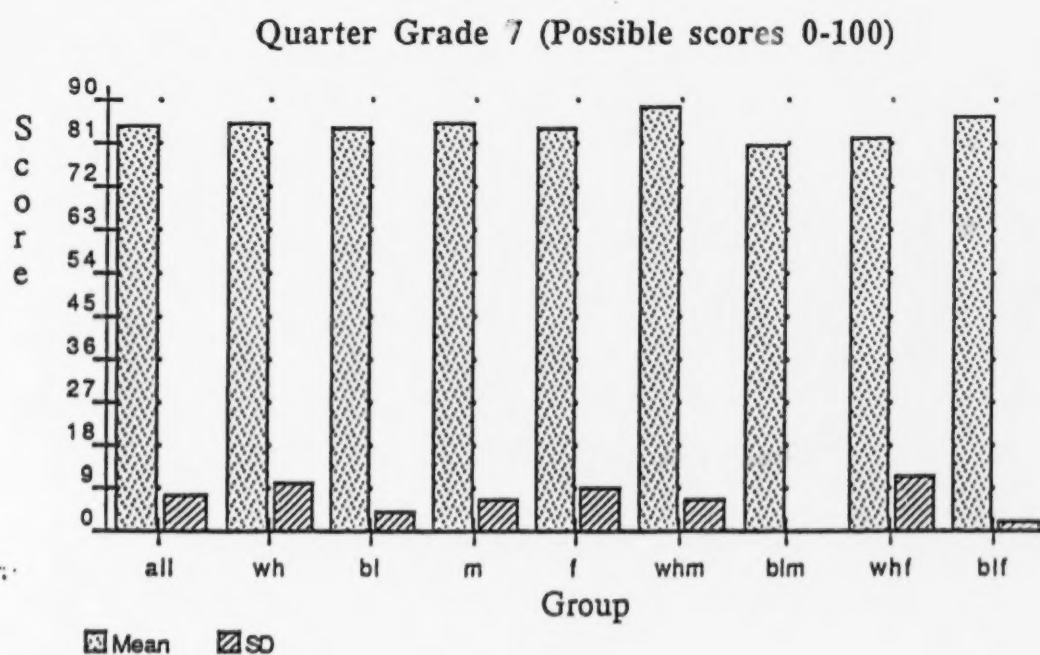


Figure 6

Total Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	4.66	4.54	4.81	4.66	4.67	5.33	3.77	3.92	5.60
SD	3.60	3.14	4.38	2.66	4.36	2.70	2.87	3.63	5.57

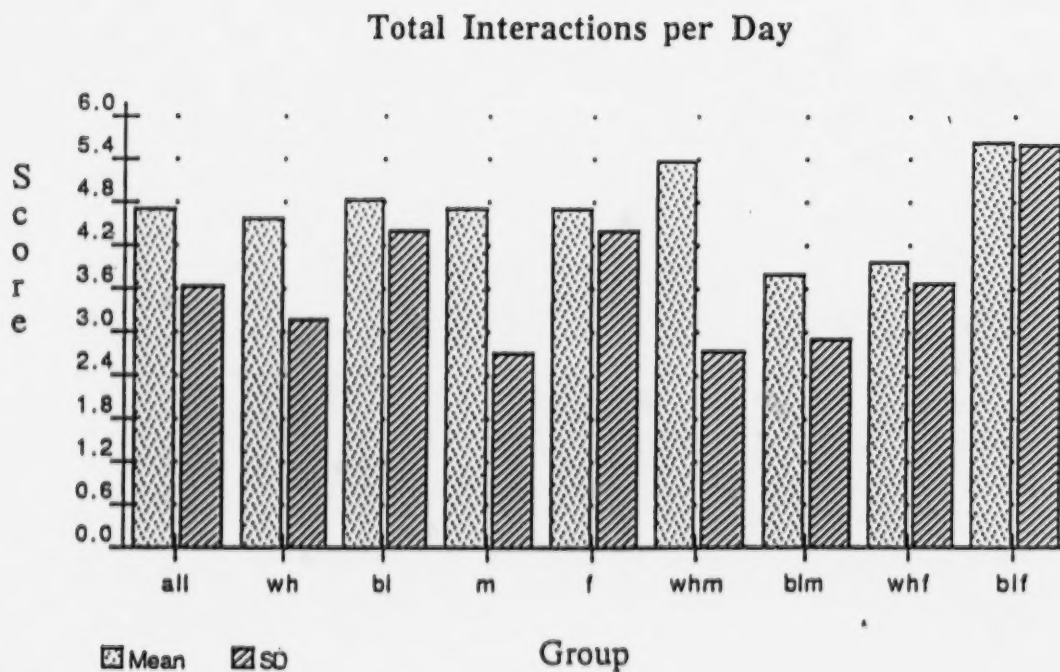


Figure 7

Teacher-Initiated Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	1.93	1.81	2.07	1.90	1.94	2.08	1.67	1.60	2.38
SD	1.15	1.09	1.30	1.26	1.14	1.62	0.80	0.51	1.63

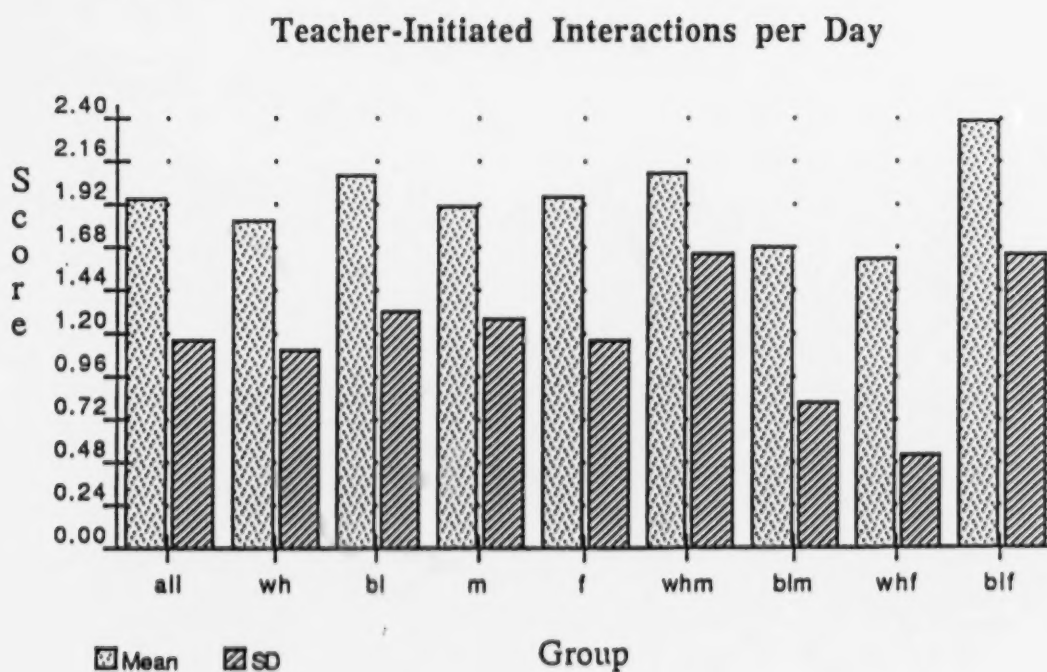


Figure 8

Student-Initiated Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	2.29	2.27	2.33	2.31	2.28	2.80	1.67	1.84	2.83
SD	2.23	2.05	2.62	1.77	2.64	1.89	1.70	2.28	3.32

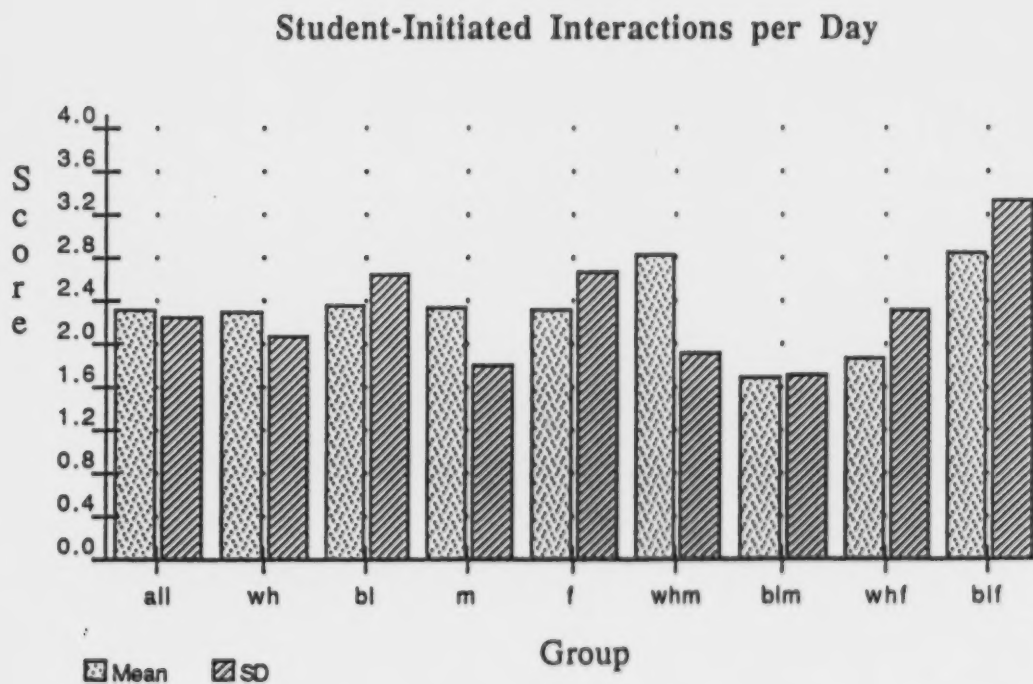


Figure 9

Academic Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	2.04	1.72	2.46	1.91	2.14	2.15	1.60	1.38	3.10
SD	1.80	1.04	2.50	1.04	2.28	1.25	0.82	0.82	3.28

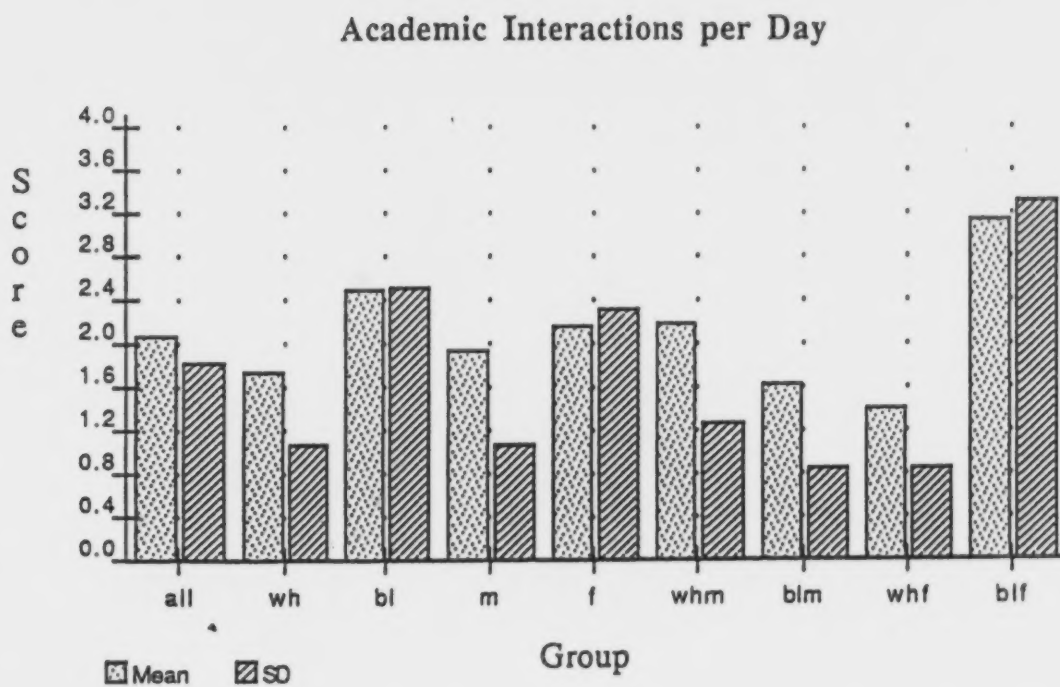


Figure 10

Teacher-Initiated Academic Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	1.13	1.03	1.26	1.06	1.19	1.13	0.97	0.96	1.48
SD	0.76	0.66	0.92	0.70	0.85	0.97	0.23	0.38	1.23

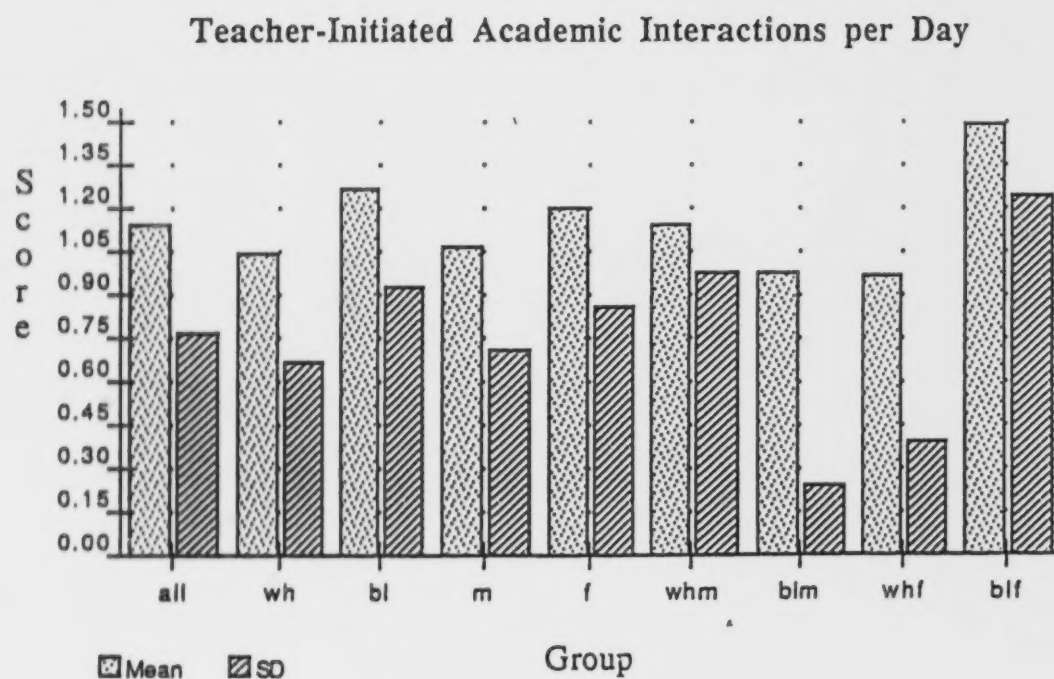


Figure 11

Student-Initiated Academic Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	0.91	0.69	1.20	0.86	0.96	1.03	0.63	0.42	1.63
SD	1.19	0.80	1.59	0.87	1.45	1.09	0.60	0.45	1.19

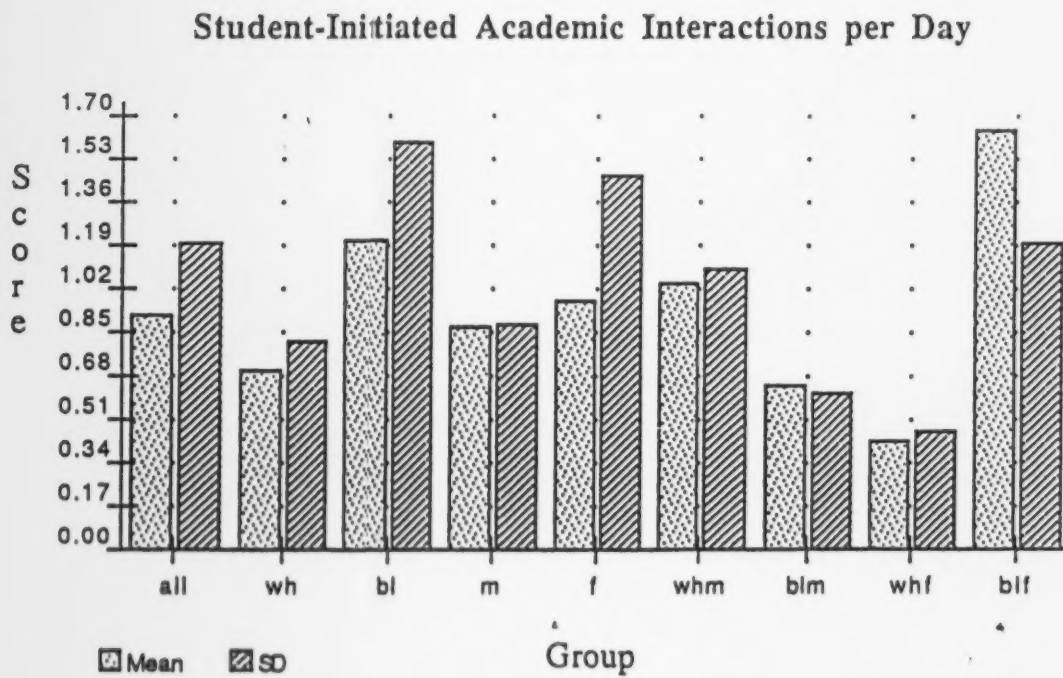


Figure 12

Procedural Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	1.74	1.91	1.53	1.87	1.64	2.18	1.47	1.70	1.58
SD	1.18	1.26	1.12	1.19	1.23	1.03	1.48	1.50	1.02

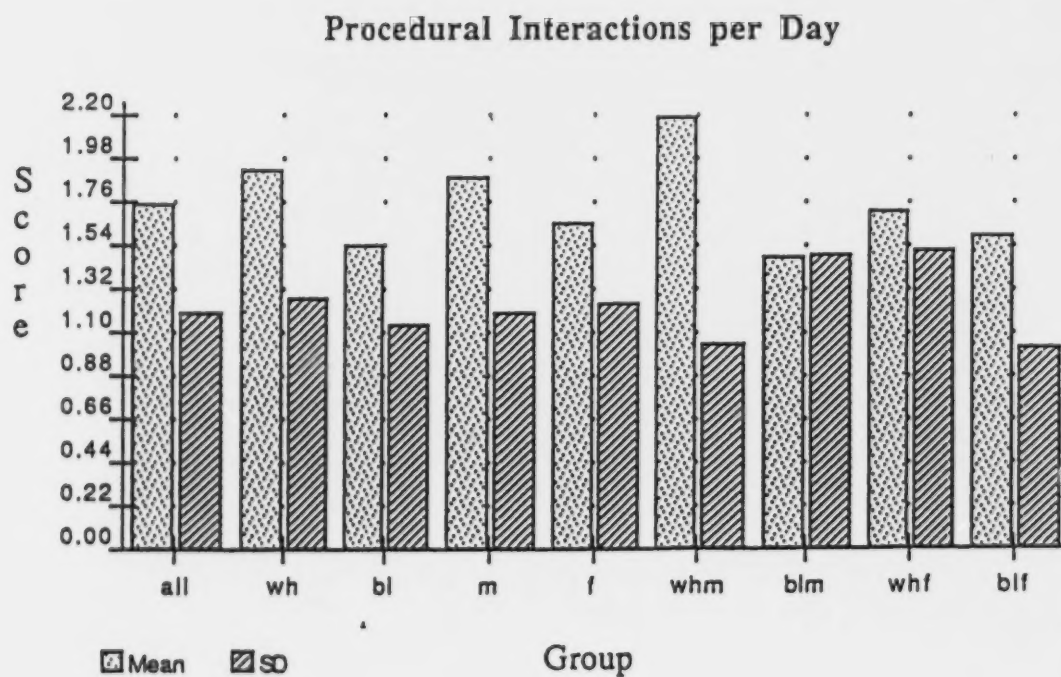


Figure 13

Teacher-Initiated Procedural Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	0.60	0.59	0.61	0.63	0.58	0.65	0.60	0.54	0.63
SD	0.29	0.25	0.36	0.39	0.20	0.34	0.53	0.17	0.26

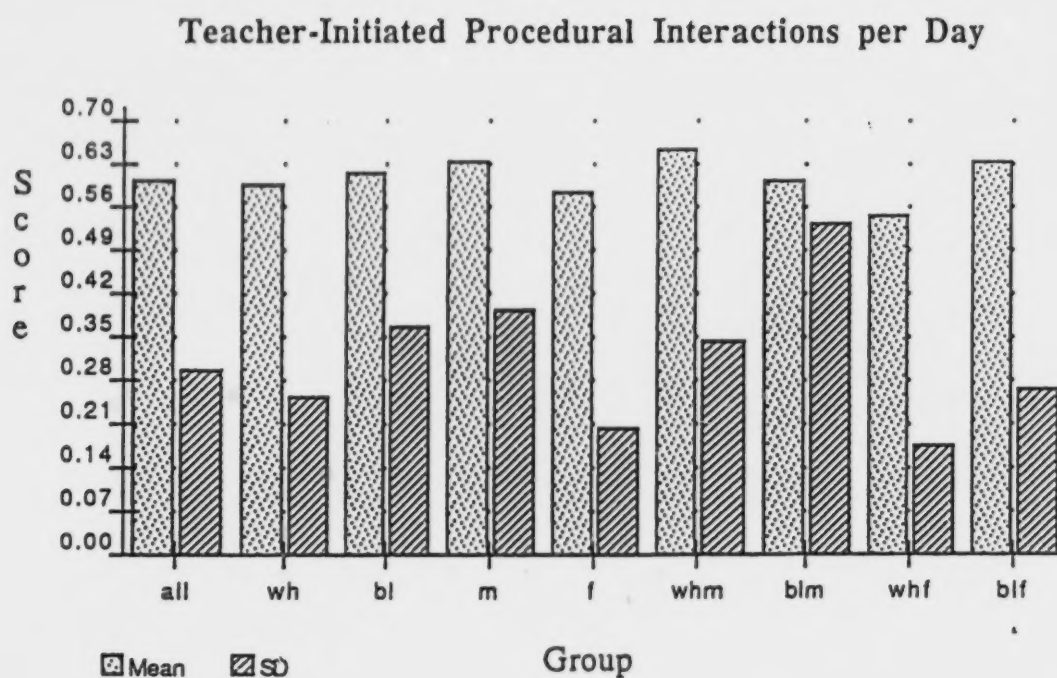


Figure 14

Student-Initiated Procedural Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	1.13	1.32	0.89	1.21	1.07	1.53	0.80	1.16	0.95
SD	0.99	1.13	0.77	0.90	1.10	0.92	0.85	1.36	0.83

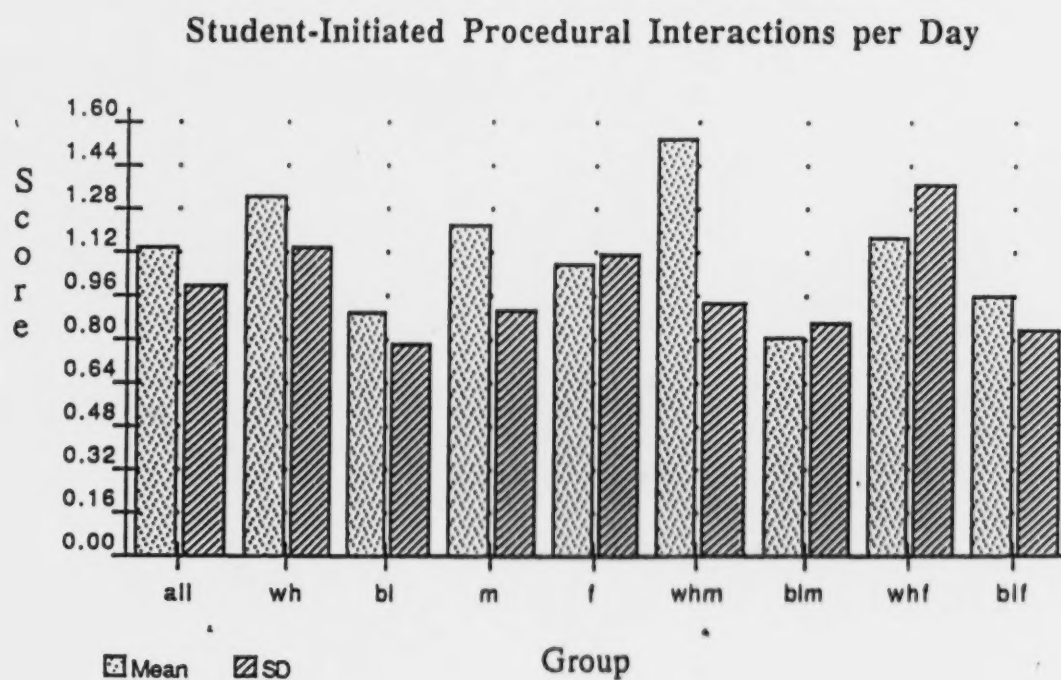


Figure 15

Social Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	0.36	0.37	0.36	0.37	0.36	0.40	0.33	0.34	0.38
SD	0.45	0.47	0.46	0.39	0.51	0.43	0.42	0.54	0.55

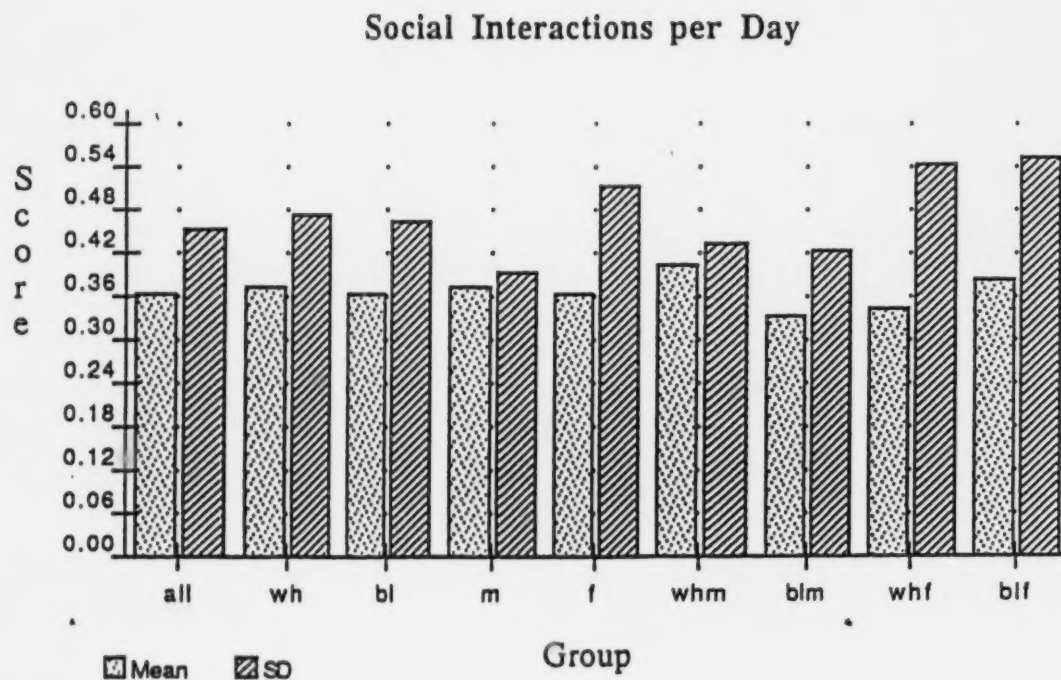


Figure 16

Teacher-Initiated Social Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	0.13	0.13	0.11	0.14	0.11	0.20	0.07	0.08	0.15
SD	0.15	0.18	0.11	0.21	0.08	0.27	0.12	0.04	0.10

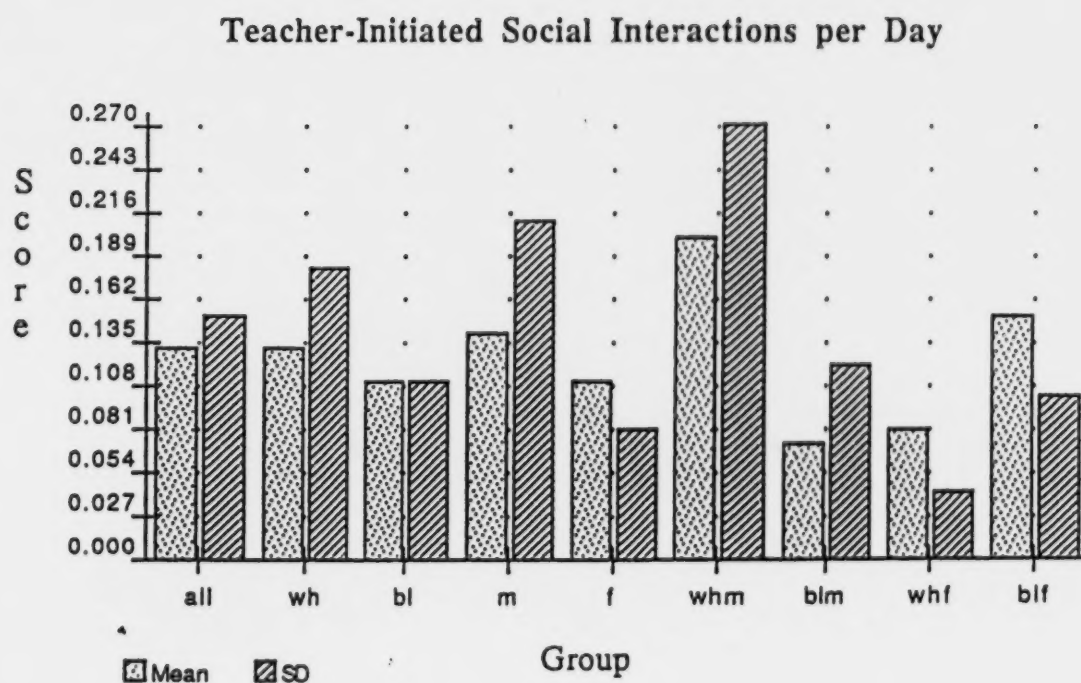


Figure 17

Student-Initiated Social Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	0.23	0.23	0.23	0.21	0.24	0.20	0.23	0.26	0.23
SD	0.36	0.39	0.35	0.20	0.46	0.18	0.25	0.53	0.45

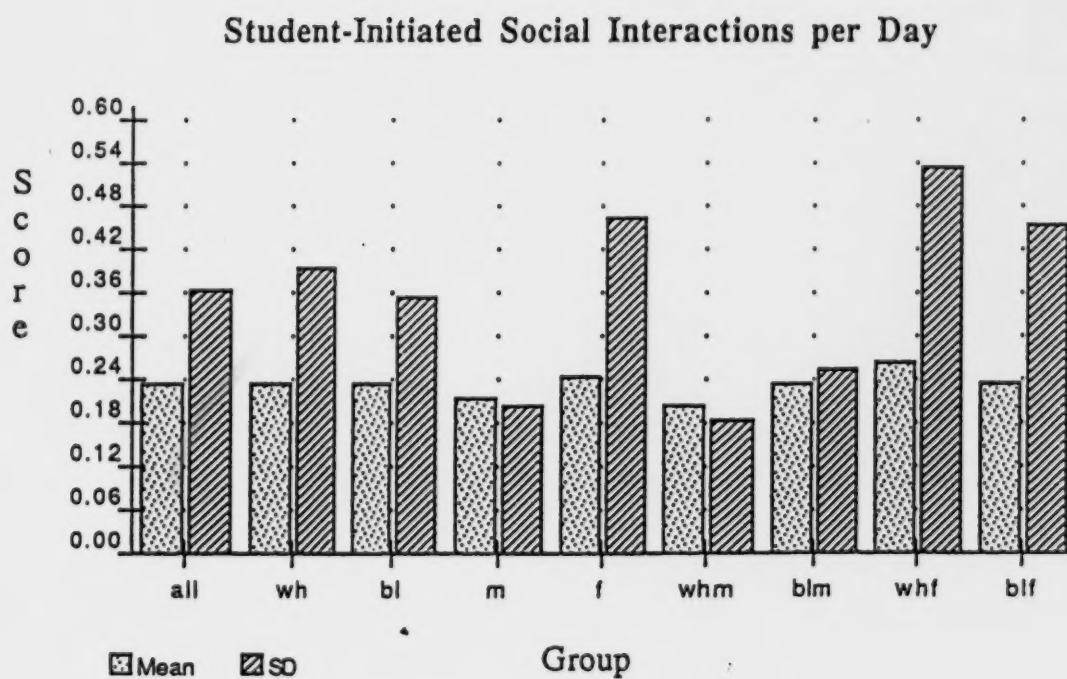


Figure 18

Behavioral Interactions per Day

	all	wh	bl	m	f	whm	blm	whf	blf
Mean	0.43	0.47	0.37	0.40	0.44	0.45	0.33	0.48	0.40
SD	0.59	0.68	0.49	0.31	0.76	0.38	0.23	0.91	0.67

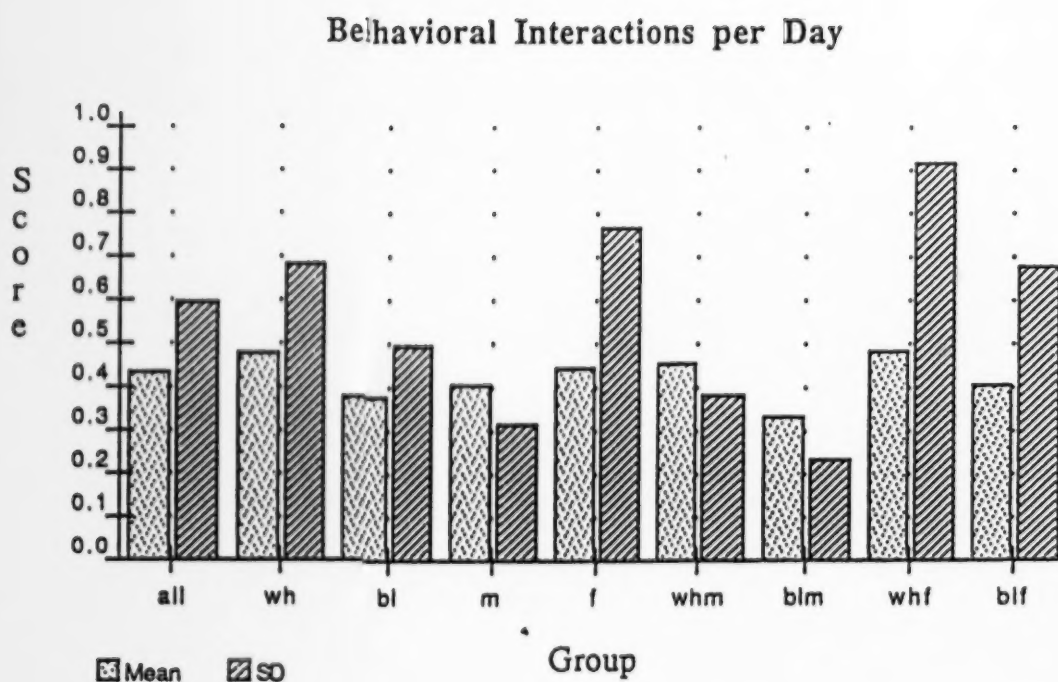


Figure 19